

Case 3431***Procynosuchus* Broom, 1937 (Therapsida, Cynodontia): proposed precedence over *Cyrbasiodon* Broom, 1931 and *Parathrinaxodon* Parrington, 1936**

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Abstract. The purpose of this application, under Articles 23.9.3 and 81.2.3 of the Code, is to conserve the generic name *Procynosuchus* Broom, 1937 for a group of Permian cynodonts (family PROCYNOSUCHIDAE) by giving it precedence over the older names *Cyrbasiodon* Broom, 1931 and *Parathrinaxodon* Broom, 1936 whenever these genera are considered synonymous. These cynodonts are of considerable importance to synapsid phylogeny and represent a key point in widely used examples of transitional series in the fossil record.

Keywords. Nomenclature; taxonomy; Therapsida; Cynodontia; PROCYNOSUCHIDAE; *Procynosuchus*; *Cyrbasiodon*; *Parathrinaxodon*; *Procynosuchus delaharpeae*; *Cyrbasiodon boycei*; *Parathrinaxodon proops*; Permian; Africa; Germany; Russia.

1. Broom (1931, p. 163) established the generic name *Cyrbasiodon* for a genus of cynodonts from the Upper Permian *Dicynodon* Assemblage Zone of South Africa. The type species (by monotypy) is *Cyrbasiodon boycei* Broom, 1931 (p. 163). The type and only known specimen of *Cyrbasiodon boycei* is an isolated maxilla housed in the Durban Museum, Natal, South Africa.

2. Parrington (1936, p. 132) established the name *Parathrinaxodon* for a genus of cynodonts from Upper Permian deposits in the Ruhuhu Valley of Tanzania. The type species (by monotypy) is *Parathrinaxodon proops* Parrington, 1936 (p. 132). The type and only known specimen of *Parathrinaxodon proops* is a partial skull, UMZC T810, housed in the University Museum of Zoology, Cambridge, England.

3. Broom (1937, p. 314) established the generic name *Procynosuchus* for a genus of cynodonts from the Upper Permian *Dicynodon* Assemblage Zone of South Africa. The type species (by monotypy) is *Procynosuchus delaharpeae* Broom, 1937 (p. 314). The holotype of *Procynosuchus delaharpeae* is RC 5, a complete skull housed in the Rubidge Collection, Wellwood, Graaff-Reinet, South Africa. Additional material consists of a nearly complete skeleton from the Luangwa Valley of Zambia (OUMNH TSK 34, housed in the Oxford University Museum of Natural History,

Oxford, England), a partial skull from the Ruhuhu Valley of Tanzania (GPIT K92, housed in the Institut und Museum für Geologie und Paläontologie der Eberhard-Karls-Universität Tübingen, Germany), and numerous skulls from South Africa (e.g. AMNH 8220, housed in the American Museum of Natural History, New York, U.S.A.; BP/1/226, 591, 1545, 1559, 2600, 3758, and 5832, housed in the Bernard Price Institute, University of the Witwatersrand, Johannesburg, South Africa; NMQR 280, housed in the National Museum, Bloemfontein, South Africa; RC 12, 72, 92, and 132, housed in the Rubidge Collection, Wellwood, Graaff-Reinet, South Africa; SAM-PK-K338, K5339, K5819, K7600, K8511, and K10394, housed in Iziko, the South African Museum, Cape Town, South Africa). Also, a partial skull assigned to *Procynosuchus* sp. is known from Permian deposits in Germany (Sues & Boy, 1988).

4. *Cyrbasiodon*, *Parathrinaxodon* and *Procynosuchus* are subjective synonyms (Hopson & Kitching, 1972; Hopson, 1991; Battail, 1991; Abdala & Allinson, 2005; Botha et al., 2007). Because of the extremely fragmentary nature of the holotype of *Cyrbasiodon boycei*, *Cyrbasiodon* has had a chequered taxonomic history. It was originally described by Broom (1931) as a probable primitive cynodont, but was considered by several subsequent authors to be a 'scaloposaurian' therocephalian (e.g. Broom, 1932; Haughton & Brink, 1954; Crompton, 1955; Watson & Romer, 1956; Romer, 1961). Mendrez (1972) redescribed the holotype of *Cyrbasiodon boycei*, assigning it to PROCYNOSUCHIDAE. She noted that it was extremely similar to the procynosuchids of the genera *Leavachia* Broom, 1948 and *Parathrinaxodon* Parrington, 1936, but concluded 'it seems preferable to maintain *Cyrbasiodon* as a separate genus, until the variations of the other PROCYNOSUCHIDAE are better known' (Mendrez, 1972, p. 51). However, additional research on procynosuchids has demonstrated that the features used by Broom (1931, 1942, 1948) to diagnose several taxa in this group, including *Cyrbasiodon*, are not reliable and can instead be interpreted as individual and ontogenetic variation as well as postmortem deformation (Brink & Kitching, 1951; Brink, 1963; Anderson, 1968; Hopson & Kitching, 1972; Battail, 1991). Therefore, many of the nominal procynosuchid taxa, including *Leavachia* Broom, 1948 and *Parathrinaxodon* Parrington, 1936, represent either ontogenetic variants or taphonomically distorted specimens of *Procynosuchus* (Battail, 1991; Hopson, 1991; Abdala & Allinson, 2005). As such, *Cyrbasiodon* has been added to the synonymy of *Procynosuchus* in more recent treatments of the genus (e.g. Battail, 1991). A new species of *Cyrbasiodon*, *C. vladimiriensis*, was established by Tatarinov (2004) on the basis of a maxillary fragment with two postcanine teeth (PIN 4818/35, housed in the Paleontological Institute of the Russian Academy of Sciences, Moscow, Russia) from the Upper Permian of the Vladimir Region of Russia. However, the diagnostic features for this taxon given in Tatarinov's (2004) description are not reliable, and it is, in our opinion, best regarded as *Procynosuchus* sp.

5. *Procynosuchus* has been universally utilised as a valid genus name in palaeontological literature since its description and represents one of the most frequently referenced cynodont taxa. A list of 75 publications (25 of which were published in the last eight years) that use *Procynosuchus* as the valid name for this taxon has been submitted to the Secretariat. In addition to its omnipresence in Permo-Triassic therapsid technical literature (see Hopson & Kitching, 2001; Rubidge & Sidor, 2001), *Procynosuchus* has been extensively referenced in popular literature on evolutionary

transitions in the fossil record (e.g. Hopson, 1987; Gould, 1993; Martin, 2004) and textbooks (e.g. Romer, 1966; Ridley, 1993; Kardong, 2002; Pough et al., 2002). Furthermore, original and cast material labeled as *Procynosuchus* is featured in many museum exhibits on mammal evolution and Permo-Triassic vertebrates including, but not limited to exhibits in the Fukui Prefectural Dinosaur Museum, Katsuyama, Japan; The Museum Korbach, Korbach, Germany; the Institut und Museum für Geologie und Paläontologie der Eberhard-Karls-Universität Tübingen, Tübingen, Germany; The Kitching Gallery of the Bernard Price Institute, University of the Witwatersrand, Johannesburg, South Africa; The National Museum, Bloemfontein, South Africa; Iziko, The South African Museum, Cape Town, South Africa; The University Museum of Zoology, Cambridge, England; and the Oxford University Museum of Natural History, Oxford, England. Conversely, the genera *Cyrbasiodon* and *Parathrinaxodon* are known by only a small group of non-mammalian cynodont taxonomists.

6. The skull and postcranium of *Procynosuchus delaharpeae* have been thoroughly described by Kemp (1979, 1980) on the basis of a nearly complete skeleton (OUMNH TSK 34) from Zambia. Because it is known from extensive, well-described material, *Procynosuchus* has been used as an operational taxonomic unit in many analyses of therapsid (especially cynodont) phylogeny (e.g. Hopson & Barghusen, 1986; Battail, 1991; Rowe, 1993; Hopson & Kitching, 2001; Sidor & Smith, 2004; Botha et al., 2007; Abdala, 2007). *Procynosuchus* holds additional importance as the type genus of the family PROCYNOSUCHIDAE, currently in wide use in therapsid literature (e.g. Hopson & Barghusen, 1986; Brink, 1986; Battail, 1991; Tatarinov, 2004, 2005). It is in the best interests of nomenclatural stability to grant priority to *Procynosuchus* Broom, 1937 over *Parathrinaxodon* Parrington, 1936.

7. The International Commission on Zoological Nomenclature is accordingly asked:

- (1) to use its plenary power to give precedence to the following names:
 - (a) *Procynosuchus* Broom, 1937 over the names *Cyrbasiodon* Broom, 1931 and *Parathrinaxodon* Parrington, 1936 whenever it and either of the other two are considered to be synonyms;
 - (b) *delaharpeae* Broom, 1937, as published in the binomen *Procynosuchus delaharpeae* (specific name of the type species of *Procynosuchus* Broom, 1937), over the names *boycei* Broom, 1931, as published in the binomen *Cyrbasiodon boycei* (specific name of the type species of *Cyrbasiodon* Broom, 1931), and *proops* Parrington, 1936, as published in the binomen *Parathrinaxodon proops* (specific name of the type species of *Parathrinaxodon* Parrington, 1936), whenever it and either of the other two are considered to be synonyms;
- (2) to place on the Official List of Generic Names in Zoology the following names:
 - (a) *Procynosuchus* Broom, 1937 (gender: masculine), type species by monotypy *Procynosuchus delaharpeae* Broom, 1937, with the endorsement that it is to be given precedence over the names *Cyrbasiodon* Broom, 1931 and *Parathrinaxodon* Parrington, 1936 whenever they are considered to be synonyms;
 - (b) *Cyrbasiodon* Broom, 1931 (gender: masculine), type species by monotypy *Cyrbasiodon boycei* Broom, 1931, with the endorsement that it is not to be

given priority over the name *Procynosuchus* Broom, 1937 whenever the two are considered to be synonyms;

- (c) *Parathrinaxodon* Parrington, 1936 (gender: masculine), type species by monotypy *Parathrinaxodon proops* Parrington, 1936, with the endorsement that it is not to be given priority over the name *Procynosuchus* Broom, 1937 whenever the two are considered to be synonyms;
- (3) to place on the Official List of Specific Names in Zoology the following names:
 - (a) *delaharpeae* Broom, 1937, as published in the binomen *Procynosuchus delaharpeae* (specific name of the type species of *Procynosuchus* Broom, 1937), with the endorsement that it is to be given precedence over the names *Cyrbasiodon boycei* Broom, 1931 and *Parathrinaxodon proops* Parrington, 1936 whenever it and either of the other two are considered to be synonyms;
 - (b) *boycei* Broom, 1931, as published in the binomen *Cyrbasiodon boycei* (specific name of the type species of *Cyrbasiodon* Broom, 1931), with the endorsement that it is not to be given priority over the name *Procynosuchus delaharpeae* Broom, 1937 whenever the two are considered to be synonyms;
 - (c) *proops* Parrington, 1936, as published in the binomen *Parathrinaxodon proops* (specific name of the type species of *Parathrinaxodon* Parrington, 1936), with the endorsement that it is not to be given priority over the name *Procynosuchus delaharpeae* Broom, 1937 whenever the two are considered to be synonyms.

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